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सामग्री — विशिष्टि
(पहला पुनरीक्षण)

**Polyamide 6 Materials for Moulding and
Extrusion — Specification**
(*First Revision*)

ICS 83.080.20

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FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Plastics Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

This standard was originally published in 1992.

The “Polyamide” is a family of polymers which have fibre, film and plastic forming properties. All ‘Polyamides’ in the polymer materials have the amide (—CO—NH—) group, the link that joins the repeating hydrocarbon units of various lengths. The intermediates for polyamides are dicarboxylic acids, diamines, amino-acids and lactams. Polyamides are usually identified numerically using the number of carbon atoms in the basic units of the polymer chains. A duplex digit is used where the polyamide is derived from a diamine and diacid, the first digit of the duplex referring to the diamine and the second digit referring to the diacid. For example, the polymer from hexamethylene diamine and adipic acid is termed as nylon 66, that from hexamethylene diamine and sebacic acid as nylon 610 and that from caprolactam as nylon 6.

Polyamide 6, also known as nylon 6 or polycaprolactam, synthesized by ring-opening polymerization of caprolactam, is a semicrystalline polymer. Polyamide 6 possesses high mechanical strength, good impact resistance and toughness, low coefficient of friction, good thermal and barrier properties and excellent chemical resistance to common solvents. Being an engineering polymer, it is consumed by different industrial segments for manufacturing of various components/parts as per application requirements.

Different intrinsic properties of virgin polyamide 6 polymer, namely, molecular weight, amino groups, carboxylic group, percent water extractable and percent moisture are tailored as per end application requirements through processing parameter changes and/or use of specific additives during its synthesis from caprolactam.

There are two major processing routes, extrusion and moulding being used in industry for processing of polyamide 6 into end application. In extrusion route, polyamide 6 is melt processed through extruder into fibre, film, cord, and rod with/without incorporation of additive(s) as per application requirement(s). In moulding route, Polyamide 6 polymer is melt processed with incorporation of additives and/or fillers in twin screw extruder which yields unfilled/filled compound. The unfilled/filled compound made thereof in twin screw extruder is further moulded (injection) for application part.

Various additives used in extrusion and moulding routes are lubricant, antioxidant, nucleating agents, UV absorbers, optical brighteners, pigments, chain enhancer/reducer etc. The fillers comprise glass fibres/beads, minerals, flame retardant compounds etc. Both additives and fillers impart salient attributes in compounds.

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Indian Standard
POLYAMIDE 6 MATERIALS FOR MOULDING AND EXTRUSION
 — SPECIFICATION
 (*First Revision*)

1 SCOPE

1.1 This standard prescribes the requirements, method of sampling and test for polyamide 6 resins and unfilled/filled compounds for moulding and extrusion.

1.2 This standard does not apply to polyamide 6 prepared through monomer casting that is anionic polymerization of caprolactam.

1.3 This standard does not apply to polyamide 6 prepared for textile fibre spinning.

1.4 This standard does not cover pigmented or coloured polyamide 6 resin and unfilled/filled compound.

NOTE — As properties of pigmented or coloured polyamide 6 resin and unfilled/filled compound can widely differ from respective natural colour polymer-based materials depending on the choice of colorants and concentrations, all such properties, test methods and specifications need to be agreed between purchaser and supplier.

1.5 This standard does not cover recycled/reprocessed polyamide 6 based resin and unfilled/filled compound.

NOTE — As properties of recycled/reprocessed polyamide 6 based resin and unfilled/filled compound can widely differ from respective virgin polymer-based material depending on type and content of recycled/reprocessed polyamide 6 used, all such properties, test methods and specifications need to be agreed between purchaser and supplier.

1.6 The properties and respective specifications included in this standard are those required in resin and unfilled/filled compound for different applications.

However, there may be other specific characteristics important for specialized application. Selection of such specific characteristics, their evaluation and acceptance are left to expertise of the user as practically it is not possible to cover all such characteristics in this standard.

1.7 The resin and unfilled/filled compound specific properties and specifications included in this standard are intended to provide a means of calling out different polyamide 6 materials used in the fabrication of various items or parts. Accordingly, the selected material needs to qualify for respective quality criteria laid down in this standard. However, the properties of material may neither predict nor correlate with entire performance of parts moulded of the material.

Caution — This standard does not purport to address the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practises and determine the applicability of regulatory limitations prior to use.

2 REFERENCES

The Indian standards and other publications listed in Annex A contain provisions which, through reference in this text, constitute provision of this standard. At the time of publication, the edition indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Annex A.

For the purpose of this standard, the definitions given in IS 2828 shall apply. Further, the following definitions shall also apply:

3.1 Unfilled Compounds — Compounds based on polyamide 6 resin with additives less than 5 percent.

3.2 Filled Compounds — Compounds based on polyamide 6 resin with additives less than five percent and fillers equal to or greater than 5 percent.

3.3 Unfilled Impact Modified Compounds — Unfilled compounds as mentioned in 3.1 with addition of impact modifiers.

3.4 Glass Filled Impact Modified Compounds — Filled compounds as mentioned in 3.2 with addition of impact modifiers.

4 TYPES AND GRADES

4.1 Polyamide 6 resins are classified into the following grades:

- i. Low viscosity grade;
- ii. Medium viscosity grade; and
- iii. High viscosity grade.

4.2 Based on the fillers, additives and impact modifier used, the polyamide 6 compounds are classified as:

- a) Filled compounds;
- b) Unfilled compounds;
- c) Glass filled impact modified compounds; and
- d) Unfilled impact modified compounds

4.2.1 Filled compounds are further classified based on additives and fillers as given below:

Polyamide 6 Compound

Type of compound

Filled Compounds	Glass filled moulding compounds
	High performance glass filled moulding compounds
	Mineral or mineral and glass filled moulding compounds

4.2.2 Filled, unfilled, filled impact modified and unfilled impact modified compounds are further classified as given in Table 2 to Table 7.

5 REQUIREMENTS

5.1 Description

Polyamide 6 resin and filled/unfilled/unfilled impact modified/filled impact modified compounds shall be in the form of granules/chips. Size of the granules/chips are to be as agreed between the purchaser and the supplier.

5.2 Polyamide 6 resins shall comply with the requirements given in Table 1 and polyamide 6 compounds shall comply to the requirements mentioned in Table 2 to Table 7 for different types of compounds as given below:

Type of compound	Requirement as per
Unfilled moulding compounds	Table 2
Glass filled moulding compounds	Table 3
High performance glass filled moulding compounds	Table 4
Mineral or mineral and glass filled moulding	Table 5

<i>Type of compound</i>	<i>Requirement as per</i>	nominal glass fibre level of 33 percent is included with 35 percent Glass.
compounds		
Unfilled impact modified moulding compounds	Table 6	5.4 Contact With Foodstuffs And Pharmaceuticals
Glass filled impact modified moulding compounds	Table 7	When the products are used in contact with foodstuffs and pharmaceuticals, its requirements with respect to material shall also meet IS 12247.
5.3 Materials containing reinforcements or fillers or both, at nominal levels not in multiples of 5 are included in the nearest grade. For example, a material with a		5.5 The material shall comply with the requirements of Table 1 to 7 when tested with methods mentioned in the last column of the respective tables.

Table 1 Requirements for Polyamide 6 Resin*(Clause 5.2, 5.5, 6.2 and F-5.2)*

Sl No.	Characteristics	Requirements			Method of Test, Refer to
		Low Viscosity Grade	Medium Viscosity Grade	High Viscosity Grade	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Relative viscosity	2.35–3.00	3.01–4.00	4.01–5.50	ISO 307 (Sulphuric acid 96 percent, 1 percent w/v, 25°C)
ii)	Water content, percent, <i>Max</i>	0.10	0.10 [0.08 ¹⁾]	0.10	Method A of ISO 15512
iii)	Matter extractable content/water extractable, percent, <i>Max</i>	0.6	0.6	1.0	Annex B/ISO 6427
iv)	Amino (—NH ₂) end group, meq/kg	40–60	20–50	45, <i>Max</i>	Annex C
v)	Carboxylic (—COOH) end group, meq/kg	40–60	20–50	45, <i>Max</i>	Annex D
vi)	UV observation	Not oxidized	Not oxidized	Not oxidized	Annex E
vii)	Ash content, percent	Nil	Nil	Nil	IS 13360 (Part 8/Sec 8) ²⁾ /ISO 3451-4
viii)	Tensile stress at yield, MPa	75 ± 10	75 ± 10	75 ± 10	IS 13360 (Part 5/Sec 1) and IS 13360 (Part 5/Sec 2)

Table 1 (concluded)

Sl No.	Characteristics	Requirements			Method of Test, Refer to
		Low Viscosity Grade	Medium Viscosity Grade	High Viscosity Grade	
(1)	(2)	(3)	(4)	(5)	(6)
ix)	Tensile nominal strain at break, percent	150 ± 100	250 ± 100	250 ± 100	IS 13360 (Part 5/Sec 1) and IS 13360 (Part 5/Sec 2)
x)	Flexural strength, MPa	95 ± 10	95 ± 10	95 ± 10	IS 13360 (Part 5/Sec 7)
xi)	Izod notched impact strength, kJ/m ²	4.0 ± 1.5	4.0 ± 1.5	4.0 ± 1.5	IS 13360 (Part 5/Sec 4) ²⁾ /Method 1A of ISO 180
xii)	Rockwell hardness, R scale	115 ± 10	115 ± 10	115 ± 10	IS 13360 (Part 5/Sec 13) ²⁾ /ISO 2039-2
xiii)	Temperature of deflection under load 1.80 MPa, °C	52 ± 3	52 ± 3	52 ± 3	IS 13360 (Part 6/Sec 3) and IS 13360 (Part 6/Sec 17)
xiv)	Density, gm/cm ³	1.12–1.15	1.12–1.15	1.12–1.15	IS 13360 (Part 3/Sec 10)

¹⁾ For Film and Industrial yarn extrusion applications.

²⁾ In case of dispute, this shall be the referee method.

Table 2 Requirements for Polyamide 6 Resin Based Unfilled Moulding Compounds

(Clause 4.2.2, 5.2 and 6.2)

Sl No.	Characteristics	Requirements			High Viscosity Grade	Methods of Test, Refer to
		General Purpose	Nucleated	High Performance		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Relative viscosity		2.35–3.00		3.01–3.65	ISO 307 (sulphuric acid 96 percent, 1 percent w/v, 25°C)
ii)	Water content, percent, <i>Max</i>	0.10	0.10	0.10	0.10	Method A of ISO 15512

Table 2 (concluded)

Sl No.	Characteristics	Requirements				Methods of Test, Refer to	
		General Purpose	Medium Viscosity Grade Nucleated	High Performance	High Viscosity Grade		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	
iii)	Matter extractable content/water extractable, percent, <i>Max</i>	1.5	1.5	1.5	1.5	Annex 6427	B ¹⁾ /ISO
iv)	Tensile stress at yield, MPa	80 ± 10	80 ± 10	85 ± 10	80 ± 10	IS 13360(Part 5/Sec 1) and IS 13360(Part 5/Sec 2)	
v)	Tensile nominal strain at break, percent	50 ± 30	35 ± 25	100 ± 50	60 ± 30	IS 13360(Part 5/Sec 1) and IS 13360(Part 5/Sec 2)	
vi)	Flexural strength, MPa	100 ± 15	100 ± 15	110 ± 15	100 ± 15	IS 13360 (Part 5/Sec 7)	
vii)	Izod notched impact strength, kJ/m ²	4.0 ± 1.5	4.0 ± 1.5	4.5 ± 1.5	4.0 ± 1.5	IS 13360 (Part 5/Sec 4) ¹⁾ / Method1A of ISO 180	
viii)	Rockwell hardness, R scale	110 ± 15	110 ± 15	110 ± 15	110 ± 15	IS 13360 (Part 5/Sec 13) ¹⁾ /ISO 2039-2	
ix)	Temperature of deflection under load 1.80 MPa, °C	52 ± 3	54 ± 3	52 ± 3	52 ± 3	IS 13360 (Part 6/Sec 3) and IS 13360 (Part 6/Sec 17)	
x)	Density, gm/cm ³	1.12–1.15	1.12–1.15	1.12–1.15	1.12–1.15	IS 13360 (Part 3/Sec 10)	

¹⁾ In case of dispute, this shall be the referee method.

Table 3 Requirements for Polyamide 6 Resin Based Glass Filled Moulding Compounds*(Clause 4.2.2, 5.2 and 6.2)*

Sl No.	Characteristics			Requirements						Method of Test, Refer to		
				15 Percent Glass Filled Grade	20 Percent Glass Filled Grade	25 Percent Glass Filled Grade	30 Percent Glass Filled Grade	35 Percent Glass Filled Grade	40 Percent Glass Filled Grade			45 Percent Glass Filled Grade
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
i)	Water	content,	percent,	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	Method A of ISO 15512
	Max											
ii)	Ash content, percent			14–16	19–21	24–26	29–31	34–36	39–41	44–46	49–51	IS 13360 (Part 8/Sec 8) ¹⁾ /ISO 3451-4
iii)	Tensile stress at break, MPa			110 ± 15	125 ± 15	145 ± 15	165 ± 15	185 ± 15	200 ± 15	215 ± 15	225 ± 15	IS 13360 (Part 5/Sec 1) and IS 13360 (Part 5/Sec 2)
iv)	Tensile strain at break, percent			3.5 ± 1.5	3.5 ± 1.5	3.5 ± 1.5	3.5 ± 1.5	3.5 ± 1.5	3.5 ± 1.5	3.5 ± 1.5	3.5 ± 1.5	IS 13360 (Part 5/Sec 1) and IS 13360 (Part 5/Sec 2)
v)	Flexural strength, MPa			160 ± 15	180 ± 15	200 ± 15	225 ± 15	245 ± 15	265 ± 15	280 ± 15	300 ± 15	IS 13360 (Part 5/Sec 7)
vi)	Izod notched impact strength, kJ/m ²			6.5 ± 1.5	7.0 ± 1.5	10.5 ± 1.5	14.5 ± 2.5	15.5 ± 2.5	18.5 ± 2.5	20.5 ± 2.5	22.0 ± 2.5	IS 13360 (Part 5/Sec 4) ¹⁾ /Method 1A of ISO 180
vii)	Rockwell hardness, R scale			110±15	110±15	110±15	110±15	110±15	110±15	110±15	110±15	IS 13360 (Part 5/Sec 13) ¹⁾ /ISO 2039–2
viii)	Temperature of Deflection under load 1.80 MPa, °C			185 ± 10	190 ± 10	190 ± 10	200 ± 10	200 ± 10	200 ± 10	200 ± 10	200 ± 10	IS 13360 (Part 6/Sec 3)and IS 13360 (Part 6/Sec17)
ix)	Density, gm/cm ³			1.22– 1.26	1.26– 1.30	1.30– 1.34	1.34– 1.38	1.39– 1.43	1.44– 1.48	1.49– 1.53	1.56– 1.60	IS 13360 (Part 3/Sec 10)
¹⁾ In case of dispute, this shall be the referee method.												

¹⁾ In case of dispute, this shall be the referee method.

Table 4 Requirements for Polyamide 6 Resin Based High Performance Glass Filled Moulding Compounds*(Clause 4.2.2, 5.2 and 6.2)*

Sl No.	Characteristics	Requirements								Method of Test, Ref to
		15 Percent Glass Filled Grade	20 Percent Glass Filled Grade	25 Percent Glass Filled Grade	30 Percent Glass Filled Grade	35 Percent Glass Filled Grade	40 Percent Glass Filled Grade	45 Percent Glass Filled Grade	50 Percent Glass Filled Grade	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
i)	Water content, percent, <i>Max</i>	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	Method A of ISO 15512
ii)	Ash content, percent	14–16	19–21	24–26	29–31	34–36	39–41	44–46	49–51	IS 13360 (Part 8/Sec 8) ¹⁾ /ISO 3451-4
iii)	Tensile stress at break, MPa	115 ± 15	130 ± 15	150 ± 15	175 ± 15	190 ± 15	205 ± 15	220 ± 15	230 ± 15	IS 13360 (Part 5/Sec 1) and IS 13360 (Part 5/Sec 2)
iv)	Tensile strain at break, percent	3.5 ± 1.5	3.5 ± 1.5	3.5 ± 1.5	3.5 ± 1.5	3.5 ± 1.5	3.5 ± 1.5	3.5 ± 1.5	3.5 ± 1.5	IS 13360 (Part 5/Sec 1) and IS 13360 (Part 5/Sec 2)
v)	Flexural strength, MPa	170 ± 15	190 ± 15	210 ± 15	235 ± 15	255 ± 15	285 ± 15	295 ± 15	305 ± 15	IS13360 (Part 5/Sec 7)
vi)	Izod notched Impact Strength, kJ/m ²	7.5 ± 1.5	8.0 ± 1.5	11.0 ± 1.5	16.0 ± 3.0	16.5 ± 3.0	19.0 ± 2.5	21.0 ± 2.5	22.5 ± 3.0	IS 13360 (Part 5/Sec 4) ¹⁾ /Method 1A of ISO 180
vii)	Rockwell hardness, R scale	110 ± 15	110 ± 15	110 ± 15	110 ± 15	110 ± 15	110 ± 15	110 ± 15	110 ± 15	IS 13360 (Part 5/Sec 13) ¹⁾ /ISO 2039–2
viii)	Temperature of deflection under load 1.80 MPa, °C	185 ± 10	190 ± 10	190 ± 10	200 ± 10	200 ± 10	200 ± 10	200 ± 10	200 ± 10	IS 13360 (Part 6/Sec 3) and IS 13360 (Part 6/Sec 17)
ix)	Density, gm/cm ³	1.22– 1.26	1.26– 1.30	1.30– 1.34	1.34– 1.38	1.39– 1.43	1.44– 1.48	1.49– 1.53	1.56– 1.60	IS 13360 (Part 3/Sec 10)

¹⁾In case of dispute, this shall be the referee method.

Table 5 Requirements for Polyamide 6 Resin Based Mineral or Mineral and Glass Filled moulding compounds*(Clauses 4.2.2, 5.2 and 6.2)*

Sl No.	Characteristics	Requirements						Method of Test, Refer to
		15 Percent Mineral Filled Grade	30 Percent Mineral Filled Grade	10 Percent Glass Filled + 20 Percent Mineral Filled Grade	20 Percent Glass Filled + 10 Percent Mineral Filled Grade	15 Percent Glass Filled + 25 Percent Mineral Filled Grade	25 Percent Glass Filled + 15 Percent Mineral Filled Grade	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Water content, percent, <i>Max</i>	0.15	0.15	0.15	0.15	0.15	0.15	Method A of ISO 15512
ii)	Ash content, percent	14–16	29–31	29–31	29–31	39–41	39–41	IS 13360 (Part 8/Sec 8) ¹⁾ /ISO 3451-4
iii)	Tensile stress at break, MPa	70 ± 15	72.5 ± 15	105 ± 15	125 ± 15	115 ± 15	140 ± 15	IS 13360 (Part 5/Sec 1) and IS 13360 (Part 5/Sec 2)
iv)	Tensile strain at break, percent	20 ± 10	15 ± 10	5.5 ± 3.0	4.5 ± 2.0	4.0 ± 1.5	3.5 ± 1.5	IS 13360 (Part 5/Sec 1) and IS 13360 (Part 5/Sec 2)
v)	Flexural strength, MPa	100 ± 15	115 ± 15	155 ± 15	165 ± 15	160 ± 15	185 ± 15	IS 13360 (Part 5/Sec 7)
vi)	Izod notched impact strength, kJ/m ²	5.5 ± 1.5	5.0 ± 1.5	4.5 ± 1.5	5.5 ± 1.5	4.5 ± 1.5	6.0 ± 1.5	IS 13360 (Part 5/Sec 4) ¹⁾ /Method 1A of ISO 180
vii)	Rockwell hardness, R scale	110 ± 15	110 ± 15	110 ± 15	110 ± 15	110 ± 15	110 ± 15	IS 13360 (Part 5/Sec 13) ¹⁾ /ISO 2039-2
viii)	Temperature of deflection under load 1.80 MPa, °C	60 ± 05	85 ± 10	185 ± 10	190 ± 10	195 ± 10	200 ± 10	IS 13360 (Part 6/Sec 3) and IS 13360 (Part 6/Sec 17)
ix)	Density, gm/cm ³	1.23–1.27	1.35–1.39	1.36–1.40	1.36–1.40	1.45–1.49	1.45–1.49	IS 13360 (Part 3/Sec 10)

¹⁾ In case of dispute, this shall be the referee method.

Table 6 Requirements for Polyamide 6 Resin Based Unfilled Impact Modified Moulding compounds*(Clauses 4.2.2, 5.2 and 6.2)*

Sl No.	Characteristics	Requirements				Method of Test, Refer to
		Medium Impact Grade	High Impact Grade	Very High Impact Grade	Super Impact Grade	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Water content, percent, <i>Max</i>	0.10	0.10	0.10	0.10	Method A of ISO 15512
ii)	Tensile stress at yield, MPa	70 ± 15	65 ± 15	50 ± 15	50 ± 15	IS 13360 (Part 5/Sec 1) and IS 13360 (Part 5/Sec 2)
iii)	Tensile nominal strain at break, percent	>10	>25	>40	>50	IS 13360 (Part 5/Sec 1) and IS 13360 (Part 5/Sec 2)
iv)	Flexural strength, MPa	80 ± 15	75 ± 15	70 ± 15	65 ± 15	IS 13360 (Part 5/Sec 7)
v)	Izod Notched Impact Strength, kJ/m ²	8.5 ± 1.5	18.0 ± 7.0	33.0 ± 7.0	51.0 ± 10.0	IS 13360(Part 5/Sec 4) ¹⁾ /Method 1A of ISO 180
vi)	Rockwell Hardness, R Scale	110 ± 15	105 ± 15	100 ± 15	100 ± 15	IS 13360 (Part 5/Sec 13) ¹⁾ /ISO 2039-2
vii)	Temperature of deflection under Load 1.80 MPa, °C	52 ± 6	51 ± 6	50 ± 6	49 ± 6	IS 13360 (Part 6/Sec 3)and IS 13360 (Part 6/Sec 17)
viii)	Density, gm/cm ³	1.09–1.14	1.08–1.13	1.07–1.12	1.06–1.11	IS 13360 (Part 3/Sec 10)

¹⁾ In case of dispute, this shall be the referee method.

Table 7 Requirements for Polyamide 6 Resin Based Glass Filled Impact Modified Moulding compounds*(Clauses 4.2.2, 5.2 and 6.2)*

Sl No.	Characteristics		Requirements				Method of Test, Refer to
			15 Percent Glass Filled Grade	30 Percent Glass Filled Grade	35 Percent Glass Filled Grade	40 Percent Glass Filled Grade	
(1)	(2)		(3)	(4)	(5)	(6)	(7)
i)	Water content, percent, <i>Max</i>		0.15	0.15	0.15	0.15	Method A of ISO 15512
ii)	Ash content, percent		14–16	29–31	34–36	39–41	IS 13360 (Part 8/Sec 8) ¹⁾ /ISO3451–4
iii)	Tensile stress at break, MPa		110 ± 15	130 ± 15	155 ± 15	165 ± 15	IS 13360 (Part 5/Sec 1) and IS 13360 (Part 5/Sec 2)
iv)	Tensile strain at break, percent		4.0 ± 1.5	4.0 ± 1.5	4.0 ± 1.5	4.0 ± 1.5	IS 13360 (Part 5/Sec 1) and IS 13360 (Part 5/Sec 2)
v)	Flexural strength, MPa		145 ± 20	180 ± 20	205 ± 20	230 ± 20	IS 13360 (Part 5/Sec 7)
vi)	Izod Impact Notched Strength, kJ/m ²		15 ± 5	20 ± 5	22 ± 5	24 ± 5	IS 13360 (Part 5/ Sec 4) ¹⁾ /Method 1A of ISO 180
vii)	Rockwell Hardness, R Scale		110 ± 15	110 ± 15	110 ± 15	110 ± 15	IS 13360 (Part 5/Sec 13) ¹⁾ /ISO 2039–2
viii)	Temperature of Deflection under Load 1.80 MPa, °C		185 ± 10	200 ± 10	200 ± 10	200 ± 10	IS 13360 (Part 6/Sec 3)and IS 13360 (Part 6/Sec 17)
ix)	Density, gm/cm ³		1.20–1.25	1.31–1.36	1.35–1.40	1.40–1.45	IS 13360 (Part 3/Sec 10)

¹⁾In case of dispute, this shall be the referee method.

6 POLYAMIDE 6 BASED SPECIAL MATERIALS

6.1 Through incorporation of special additives and/or fillers in polyamide 6 resin, special materials are made for electrical, flame retardant, lubricating, high temperature, outdoor packaging etc, applications. To address the testing requirements of special materials, characteristics of these materials have been incorporated in Table 8.

NOTE — For any of application segments, the values of characteristics of special material and test methods are not incorporated in Table 8 as its characteristics (combination of special + general/basic) widely vary with performance requirements and every possible combination of properties is not feasible to include in standard. The characteristics are as per the agreement between the purchaser and the supplier.

6.2 Special materials shall also be tested for the requirements as given in Table 1 to 7, as applicable.

Table 8 Properties of Polyamide 6 Based Special Materials

(Clause 6.1)

SI No.	Characteristics
(1)	(2)
i)	Electrical Properties
	a) Dielectric strength, kV/mm
	b) Comparative tracking index, Volt
	c) Volume resistivity, ohm*m
	d) Surface resistivity, ohm
	e) Relative permittivity
	f) Dissipation factor
	g) Insulation resistance, ohm

Table 8 (Continued)

SI No.	Characteristics
(1)	(2)
ii)	Flame Retardant Properties
	a) Flammability rating
	b) Burning behaviour class,
	c) Relative temperature index, °C
	d) Glow wire flammability index, °C
	e) Glow wire ignition temperature, °C
iii)	Wear Resistant/Lubricating Properties
	a) Lubricating additive content in unfilled/filled compound, percent
iv)	Heat resistant properties
	a) Change in optical, mechanical, thermal, electrical, flammability and physical properties upon heat exposure
v)	Weather resistant (UV stabilization) properties
	a) Change in optical, mechanical, thermal, electrical, flammability and physical properties upon weather exposure
vi)	Film Properties
	a) Elastic modulus, MPa
	b) Tensile strength at yield, MPa
	c) Tensile strength at break, MPa
	d) Elongation at yield, percent
	e) Elongation at break, percent
	f) Tear resistance, N
	g) Puncture resistance, N
	h) Dart drop impact, g
	j) Static coefficient of friction
	k) Dynamic coefficient of friction
	m) Haze

Table 8 (concluded)

SI No.	Characteristics
(1)	(2)
	n) Transparency/Clarity, percent
	p) Water vapour transmission rate, g/(m ² *24 hr)
	q) Oxygen transmission rate, cm ³ (m ² *24 hr*0.1 MPa)
	r) Carbondioxide transmission rate, cm ³ (m ² *24 hr*0.1 MPa)
	s) Nitrogen transmission rate, cm ³ (m ² *24 hr*0.1 MPa)
vii)	Lubricating and/or Nucleating properties
	a) Lubricating agent content in film grade resin, mg/kg
	b) Nucleating agent content in film grade resin, mg/kg
	c) Food contact compliance

7 PREPARATION OF TEST SPECIMENS

7.1 Treatment of Material Before Moulding

Before injection moulding, the percent moisture content shall not exceed 0.1 percent in polyamide 6 material and 0.15 percent in unfilled/filled compounds respectively. The percent moisture shall be expressed as a percentage of the total mass of material.

If the moisture content is found exceeding the limit as stated above at the time of moulding, the material may be dried by a variety of methods such as raising the temperature of the material up to 80 to 100°C in a vacuum or in a stream of dry nitrogen using a desiccant-bed drier. Drying should be continued until the moisture content is within the stated limit.

7.2 Injection Moulding of Test Specimens

For the acquisition and presentation of comparable data, injection moulded specimens are used for testing so that valid comparisons between materials can be made. These data represents the most basic approach for characterisation of material.

Test specimens shall be prepared by an injection moulding process in accordance with IS 13360 (Part 2/Sec 3). As exact conditions required to prepare suitable specimens will vary for each material, any injection moulding requirement which differ from the above practices take precedence.

The specimens are always prepared by the same procedure using the same processing conditions, unless otherwise stated for specific materials.

Recommended melting process temperature for injection moulding are given in Table 9.

Table 9 Melting Process Temperature for Injection Moulding of Polyamide 6 Resin and Unfilled/Filled Compound Based Specimens
(Clause 7.2)

SI No.	Type of Material	Melt Process Temperature, (°C)
(1)	(2)	(3)
i)	Resin, R.V. 2.35 to 3.00	240 to 255
ii)	Resin, R.V. > 3.00 up to 3.60	255 to 265
iii)	Resin, R.V. > 3.60 up to 4.00	265 to 275
iv)	Resin, R.V. > 4.00 up to 5.50	275 to 290
v)	Unfilled compound (resin R.V. 2.35 to 3.00)	240 to 255

Table 9 (Continued)

Sl No.	Type of Material	Melt Process Temperature, (° C)
(1)	(2)	(3)
vi)	Unfilled compound (resin R.V. > 3.00 up to 3.65)	255 to 265
vii)	Glass filled compound (filler 15 percent)	250 to 260
viii)	Glass filled compound (filler > 15 percent up to 35 percent)	260 to 275
ix)	Glass filled compound (> 35 percent)	275 to 290
x)	Mineral filled (filler 15 percent and 30 percent)	245 to 255
xi)	Glass filled (10 percent) + Mineral filled (20 percent)	250 to 260
xii)	Glass filled (20 percent) + Mineral filled (10 percent)	250 to 260
xiii)	Glass filled (25 percent) + Mineral filled (15 percent)	265 to 275
xiv)	Glass filled (15 percent) + Mineral filled (25 percent)	265 to 275
xv)	Unfilled impact modified	240 to 250
xvi)	Glass filled (15 percent) impact modified	250 to 260

Table 9 (Concluded)

Sl No.	Type of Material	Melt Process Temperature, (° C)
(1)	(2)	(3)
xvii)	Glass filled (30 percent and 35 percent) impact modified	265 to 275
xviii)	Glass filled (40 percent) impact modified	275 to 285

Besides injection moulding, other methods are also used to manufacture polyamide 6 specimen e.g, extrusion, blow moulding and methods using mouldless technologies. Different methods of manufacture can lead to significantly different properties, and it might be useful to measure these properties using test specimens prepared by the same method.

8 CONDITIONING

8.1 Conditioning

All test data shall be obtained using Dry-As-Moulded (DAM) specimens, defined as those specimens that are sealed in containers that are impermeable to water vapour within one hour after removal from the mould. Maximum moisture content of specimen shall be 0.2 percent. No moisture shall be intentionally added to reach this level. Specimens shall be conditioned for minimum of 24 h in sealed containers.

NOTE— As the physical and mechanical properties of Polyamide 6 is highly dependent upon moisture content of the moulded specimen, user may also refer to the manufacturer's literature for details.

8.2 Test conditions

Conduct test, other than solution viscosity or those tests conducted at elevated temperature, in the standard laboratory atmosphere at $23 \pm 2^{\circ}\text{C}$ and 50 ± 5 percent

relative humidity. Individual specimens shall not be removed from sealed containers until immediately before testing.

9 PACKING AND MARKING

9.1 Packing

The material shall be packed in suitable form of packaging, as agreed to between the purchaser and the supplier. The packaging shall be designed to ensure protection against ingress of moisture and damage during the shipment, handling and storage.

9.2 Marking

Each package shall be clearly marked with the following:

- a. Name and type of the material,
- b. Net mass of the material,
- c. Batch number/lot number,
- d. Month and year of manufacture of the material,

- e. Indication of the source of manufacture and trademark; if any, and

- f. Any other statutory requirements.

9.3 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and *the Rules and Regulations* framed thereunder, and the products may be marked with the Standard Mark.

10 SAMPLING

For the purpose of ascertaining the conformity of a consignment of materials to this specification, the scale of sampling and criteria for conformity shall be as given in Annex F.

ANNEXA

(Clause 2)

LIST OF REFERRED INDIAN STANDARDS/OTHER PUBLICATIONS

<i>IS No./Other Publications</i>	<i>Title</i>
IS 1070 : 1992	Reagent grade water — Specification (<i>third revision</i>)
IS 2828 : 2019/ISO 472 : 2013	Plastics — Vocabulary (<i>second revision</i>)
IS 4905 : 2015/ISO 24153 : 2009	Random sampling and randomization procedures (<i>first revision</i>)
IS 12247 : 1988	Specification for nylon-6 polymer for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
IS 13360 (Part 2/Sec 3) : 2019/ISO 294-1 : 2017	Plastics — Methods of testing — Part 2 Sampling and preparation of test specimens, Section 3 Injection moulding of test specimens of thermoplastic materials — General principles and moulding of multipurpose and bar test specimens (<i>first revision</i>)
IS 13360 (Part 3/Sec 10) : 2016/ISO 1183-1 : 2012	Plastics — Methods of testing — Part 3 Physical and dimensional properties, Section 10 Determination of density of non-cellular plastics — Immersion method, liquid pycnometer method and titration method
IS 13360 (Part 5/Sec 1) : 2018/ISO 527-1 : 2019	Plastics — Methods of testing — Part 5 Mechanical properties, Section 1 Determination of tensile properties — General requirements (<i>first revision</i>)
IS 13360 (Part 5/Sec 2) : 2017/ISO 527-2 : 2012	Plastics — Methods of testing — Part 5 Mechanical properties, Section 2 Determination of tensile properties — Test conditions for moulding and extrusion plastics
IS 13360 (Part 5/Sec 4) : 2021/ISO 180 : 2019	Plastics — Methods of testing — Part 5 Mechanical properties, Section 4 Determination of izod impact strength
IS 13360 (Part 5/Sec 7) : 2017/ISO 178 : 2010	Plastics — Methods of testing — Part 5 Mechanical properties, Section 7 Determination of flexural properties
IS 13360 (Part 5/Sec 13) : 1992	Plastics — Methods of testing — Part 5 Mechanical properties, Section 13 Determination of rockwell hardness
IS 13360 (Part 6/Sec 3) : 2017/ISO 75-1 : 2013	Plastics — Methods of testing — Part 6 Thermal properties, Section 3 Determination of temperature of deflection under load — General test method

IS No./Other Publications

Title

IS 13360 (Part 6/Sec 17) : 2017/ISO 75-2 : 2013	Plastics — Methods of testing — Part 6 Thermal properties, Section 17 Determination of temperature of deflection under load — Plastics and ebonite (<i>second revision</i>)
IS 13360 (Part 8/Sec 8) : 2021/ISO 3451-1 : 2019	Plastics — Methods of testing — Part 8 Permanence/Chemical properties, Section 8 Determination of ash — General methods
ISO 307 : 2019	Plastics — Polyamides — Determination of viscosity number
ISO 2039-2 : 1987	Plastics — Determination of hardness — Part 2 Rockwell hardness
ISO 3451-4 : 1998	Plastics — Determination of ash — Part 4 Polyamides
ISO 6427 : 2013	Plastics — Determination of matter extractable by organic solvents (conventional methods)
ISO 15512 : 2019	Plastics — Determination of water content

ANNEX B

[Table 1, Sl no. iii) and Table 2, Sl no. iii)]

MATTER EXTRACTABLE CONTENT/WATER EXTRACTABLE**B-1 GENERAL**

The hot water extractable are low molecular weight constituents such as monomer and oligomer by-products of the polymerization reaction. A high content of extractable in the polymers are undesirable because of vapour formation in the spinning and deposits on the nozzle plates. Therefore, it must be removed in a chip's extraction stage. The polymer melt is generating monomer in the spinning ducts by re-equilibrium reactions.

B-2 REAGENT

B-2.1 Reagent Grade Water (see IS 1070).

B-3 APPARATUS

B-3.1 Analytical Balance, with accuracy to ± 0.0001 g.

B-3.2 Heating Mantle, with temperature controller.

B-3.3 Refractometer

B-3.4 Glass Cylinder, 100 ml.

B-3.5 Volumetric Flask, 100 ml.

B-3.6 Round Bottom Flask, 250 ml.

B-3.7 Condenser, hollow type (45.72 cm long).

B-3.8 Funnel, with wire gauge.

B-4 PROCEDURE

Weigh about 10-20 g of dried sample to nearest 0.01 g, transfer it into round bottom flask (250 ml) with standard joint. Add 70-80 ml reagent grade water and keep flask fitted with condenser in heating mantle. Start water flow as required. Start heating the mantle by adjusting temperature to 85-90°C. Reflux for 8 h. Cool it down to room temperature. Transfer the water in 100 ml volumetric flask using funnel with wire gauge. Make up to the mark with reagent grade water. Note down reading as Brix at 20°C on refractometer by putting drop on prism as A.

B-5 CALCULATION

$$\text{Percent water extractable} = \frac{A \times 100}{M}$$

where

A = Reading of Brix; and

M = Weight of sample.

ANNEX C

[Table 1, Sl No. iv)]

DETERMINATION OF AMINO (—NH_2) END GROUPS

C-1 GENERAL

This method covers the analytical procedure for determination of amino (—NH_2) end groups in polyamide. The result is a criterion for the degree of polymerization.

C-2 REAGENT

C-2.1 p-Toluene Sulphonic Acid.

C-2.2 Percent Thymol Blue Indicator — Prepare the indicator by dissolving 0.1 g thymol blue in 100 ml of reagent grade water.

C-2.3 Freshly Distilled m-Cresol — Take 1 l round bottom flask with standard joint and transfer 500 ml of m-cresol in it. Connect the air condenser having a bend and raise the temperature of the flask carefully to about 100°C . Collect the distillate in a 500 ml standard joint flask. Stop the distillation when about 50 ml of the m-cresol (as residue) is left in the distilling flask. Store the distilled m-cresol in air-tight amber coloured bottle.

C-2.4 N/20 p-Toluene Sulphonic Acid — Take exactly weighed 2.375 g p-toluene sulphonic acid in 250 ml volumetric flask. Dissolve and make up to mark with reagent grade water.

C-2.5 Standardization of N/20 p-Toluene Sulphonic Acid — Take 5 ml N/20 p-toluene sulphonic acid in 250 ml flask, add 50 ml reagent grade water. Titrate against N/50 NaOH using phenolphthalein indicator. Note down reading of N/50 NaOH as V_2 .

Exact normality of N/20 p-Toluene sulphonic acid (N_1) = $(V_2 \times N_2)/V_1$

where

V_1 = Volume of N/20 p-toluene sulphonic acid;

V_2 = Volume of N/50 NaOH used; and

N_2 = Normality of N/50 NaOH.

C-3 APPARATUS

C-3.1 Microburette/Dosimate-Piston Burette.

C-3.2 Standard Joint Conical Flask, 100 ml.

C-3.3 Magnetic Stirrer, with hot plate.

C-3.4 Pipette, 20 ml.

C-3.5 Analytical Balance, with accuracy to ± 0.0001 g.

C-4 PROCEDURE

Weigh accurately about 0.500 ± 0.0001 g sample and transfer it to 100 ml standard joint conical flask. Add 20 ml of m-cresol to it. Heat gently the flask on hot plate with stirring at nearly 65°C till the chips get dissolved. Similarly carry out a blank set by taking 20 ml m-cresol. Stop heating when the chips get dissolved, cool the flask to about $40-45^\circ\text{C}$ and titrate against N/20 p-toluene sulphonic acid using thymol blue as indicator. The end point will be from yellow to red (Burette reading). Similarly run blank titration (blank). Care should be taken during the titration as the consumption of the titrate is very low and wait for two seconds after adding each drop of reagent.

C-5 CALCULATION

1 000 ml 1 N p-toluene sulphonic acid = 1 g equivalent of —NH_2

1 ml 1 N p-toluene sulphonic acid = 1 milli equivalent of —NH_2

$$\text{—NH}_2 \text{ end group (meq/kg)} = \frac{(V_1 - \text{Blank}) \times N_1 \times 1000}{M}$$

where

N_1 = Normality of N/20 p-toluene sulphonic acid;

V_1 = Volume of N/20 p-toluene sulphonic acid used; and

M = Weight of sample in gram.

ANNEX D

[Table1, Sl No. v)]

DETERMINATION OF CARBOXYLIC (—COOH) END GROUPS

D-1 GENERAL

This method covers the analytical procedure for determination of carboxylic (—COOH) end groups in polyamide. The result is a criteria for degree of polymerization and depends on the length of the chains.

D-2 REAGENT

D-2.1 Benzyl Alcohol, Chloride Free — Use freshly distilled benzyl alcohol.

D-2.2 Sodium Hydroxide Analytical Reagent/General Reagent.

D-2.3 N/30 Benzyl Alcoholic Sodium Hydroxide — Weigh exactly 0.133 3 g of NaOH pellets in 100 ml dry volumetric flask and add few drops of reagent grade water just to dissolve the pellets. Then add 10 ml methyl alcohol (which resists the formation of turbidity and yellowish tinges of the solution). Dilute the solution to 100 ml with benzyl alcohol and stir well.

D-2.4 N/20 Potassium Hydrogen Phthalate Solution — Weigh exactly 2.552 8 g potassium hydrogen phthalate in 250 ml volumetric flask, dissolve and make up to mark by reagent grade water.

D-2.5 Standardization of N/20 Potassium Hydrogen Phthalate — Take 5 ml of N/20 potassium hydrogen phthalate solution in 250 ml flask, add 50 ml reagent grade water. Titrate against N/50 NaOH using phenolphthalein indicator. Note down reading of N/50 NaOH as V_2 .

$$\text{Exact Normality of N/20 Potassium Hydrogen Phthalate (N}_1\text{)} = V_2 \times N_2/V_1$$

where

V_1 = Volume of N/20 Potassium Hydrogen Phthalate taken;

V_2 = Volume of N/50 NaOH used; and

N_2 = Normality of N/50 NaOH.

D-2.6 Standardization of N/30 Benzyl Alcoholic Sodium Hydroxide — Take 5 ml N/20 potassium hydrogen phthalate solution in 250 ml flask. Titrate it against N/30 benzyl alcohol sodium hydroxide using phenolphthalein indicator. Note down reading of N/30 benzyl alcohol sodium hydroxide as V_3 .

$$\text{Exact normality of N/30benzyl alcohol NaOH (N}_3\text{)} = V_2 \times N_2/V_3$$

where

V_2 = Volume of N/20 Potassium Hydrogen Phthalate taken;

N_2 = Normality of N/20 Potassium Hydrogen Phthalate; and

V_3 = Volume of N/30 Benzyl alcohol NaOH used.

D-2.7 0.1 Percent Phenolphthalein Indicator.

D-3 APPARATUS

D-3.1 Micro Burette/Dosimate-Piston Burette.

D-3.2 Standard Joint Conical Flask, 100 ml.

D-3.3 Magnetic Stirrer, with hot plate.

D-3.4 Pipette, 20 ml.

D-3.5 Analytical Balance, with accuracy to ± 0.0001 g.

D-4 PROCEDURE

Weigh 0.500 ± 0.0001 g of chips accurately into 100 ml standard joint flask and add 20 ml of benzyl alcohol. Reflux the content at around 160-170°C for about 45 min. The rate of dissolving depends on the type of the sample, (usually between 20 and 30 min) and the solution may change from nearly colourless to yellow or brownish.

When the polyamide has completely dissolved, stop the refluxing and titrate against N/30 benzyl alcoholic sodium hydroxide using phenolphthalein as indicator. End point will be from colorless to pink. Simultaneously, a blank test must be carried out by treating 20 ml of benzyl alcohol in the same way as the sample. The consumption of standard N/30 benzyl alcoholic sodium hydroxide amounts between 1.0-1.5 ml. Therefore, titration should be carried out with great care and wait for two seconds after addition of each drop of reagent.

D-5 CALCULATION

1 ml of 1 N benzyl alcoholic NaOH = 1 meq of —COOH group.

$$\text{—COOH group (meq/kg)} = \frac{(V_1 - \text{Blank}) \times N_1 \times 1000}{M}$$

where

N_1 = Normality of N/30 Benzyl alcoholic NaOH;

V_1 = Volume of N/30 Benzyl alcoholic NaOH used; and

M = Weight of sample in gram.

ANNEX E

[Table 1, Sl No.(vi)]

DETERMINATION OF OXIDIZATION OF THE POLYAMIDE CHIPS BASED UPON THE TRANSMISSION OF UV LIGHT

E-1 GENERAL

This method covers the analytical procedure for determining the oxidation of the polyamide chips based upon the transmission of UV light.

E-2 APPARATUS

E-2.1 Analytical Balance, with accuracy to ± 0.0001 g.

E-2.2 UV Cabinet, with UV tube (8 W).

E-2.3 Petri Dish (15.24 cm diameter).

E-3 PROCEDURE

E-3.1 For UV Observation — Take about 10g of chips in a Petridish and scatter it

uniformly throughout the dish. Place it under UV light and observe their shade. The oxidised material absorbs the UV light and so when viewed under UV light, the material is seen white, while the non-oxidised material is seen transparent giving violet colour appearance. Determine the quality on the basis of their shade.

E-4 RESULT

If the chips found oxidised, then calculate number of chips oxidised per 10 g and report as number of chips oxidised per 10 g of sample.

ANNEX F*(Clause 10)***SAMPLING OF POLYAMIDE 6 MATERIAL AND UNFILLED/FILLED COMPOUND****F-1 GENERAL REQUIREMENTS OF SAMPLING**

F-1.1 Sample shall not be taken in an exposed place.

F-1.2 The sampling instrument, which shall be made of glass, stainless steel or any other material on which polyamide 6 resin and unfilled/filled compound has no action, shall be clean and dry.

F-1.3 Precautions shall be taken to protect sample, the material being sampled, the sampling instrument and the bag(s)/container(s) selected for sampling from adventitious contamination.

F-1.4 The sample quantity collected in each bag/container shall be 250 percent of the sample quantity requirement for one testing.

F-1.5 The sample shall be placed in bag(s)/container(s) and immediately heat sealed/sealed airtight to prevent ingress of moisture.

F-1.6 Each sample bag/container shall be marked with full details of sampling, grade, batch/lot number, date of sampling and the month and year of manufacture of the material.

F-2 SCALE OF SAMPLING**F-2.1 Lot**

In a single consignment, all the containers of the same type of the material and drawn from a single batch of manufacture shall constitute a lot. If a consignment is declared or known to consist of different batches of manufacture, the batches shall

be marked separately and the groups of containers in each batch shall constitute separate lots.

F-2.2 Sample(s) shall be tested for each lot for ascertaining the conformity of the material to the requirements of respective specifications.

F-2.3 The number of samples to be tested from a lot shall depend upon the size of the lot as per Table 10.

Table 10 Number of Containers to be selected for Sampling

(Clause F-2.3 and F-5.1)

SI No.	Lot Size (MT)	Number of the Sealed Bag/Package for Sampling
(1)	(2)	(3)
i)	Up to 20	1
ii)	21 to 50	2
iii)	51 to 100	3
iv)	101 and above	4

F-2.4 These containers shall be chosen at random from the lot in order to ensure the randomness of selection, the procedure given in IS 4905 may be followed.

F-3 TEST SAMPLE AND REFERENCE SAMPLE**F-3.1 Preparation**

For lots size more than 20 MT, to prepare a composite sample from two or more containers, sample from all containers shall be mixed as thoroughly as possible by suitable means in appropriate size

container till homogeneous mixing is attained. The required quantity of sample is then drawn from above composite sample and tested.

F-3.2 Reference Sample

One sample quantity required for testing from composite sample prepared at **F-3.1** shall be transferred immediately to thoroughly dried bag/container and heat sealed/sealed airtight. This sample bag/container shall be marked with all the particulars of sampling given under **F-1.6** and preserved as reference sample for period of 30 days, *Min.* This sample is to be used in case of dispute between the purchaser and the supplier.

F-4 NUMBER OF TESTS

F-4.1 Tests for all the requirements shall be conducted on composite samples.

F-5 CRITERIA FOR CONFORMITY

F-5.1 All the containers selected in column 2 of Table 10 shall be subjected to visual examination. The test on composite sample shall be conducted only when the material is found to be satisfactory after visual examination.

F-5.2 The lot shall be declared as conforming to the requirements of this standard if all the test results conducted on composite sample satisfy the requirements given in Table 1 to 7, as applicable.

ANNEX G*(Foreword)***COMMITTEE COMPOSITION**

Plastics Sectional Committee, PCD 12

<i>Organization(s)</i>	<i>Representative(s)</i>
Central Institute of Plastics Engineering & Technology (CIPET), Chennai	PROF (DR) SHISHIR SINHA (Chairman) DR S. N. YADAV DR SMITA MOHANTY (<i>Alternate</i>)
All India Plastics Manufacturers Association (AIPMA), New Delhi	SHRI DEEPAK BALLANI
Central Pollution Control Board, New Delhi	MISS DIVYA SINHA SHRI C. K. DIXIT (<i>Alternate</i>)
Chemical and Petrochemical Manufacturers Association (CPMA) New Delhi	SHRI MAHINDER SINGH
Coca-Cola India Pvt Ltd, Gurugram	SHRI VIRENDRA LANDGE SHRI RAJENDRA DOBRIYAL (<i>Alternate</i>)
Consumer Association of India (CONCERT), Chennai	SHRI G. SANTHANARAJAN SHRI M. R. KRISHNAN (<i>Alternate</i>)
CSIR- National Chemical Laboratory (NCL), Pune	DR P. R. SURESHA DR R. V. GUNDLOORI (<i>Alternate</i>)
CSIR-Central Food Technological Research Institute (CFTRI), Mysore	SHRI R. S. MATCHE
CSIR-Indian Institute of Toxicological Research (IITR), Lucknow	DR V. P. SHARMA DR A. B. PANT (<i>Alternate</i>)
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Food Safety and Standards Authority of India (FSSAI), Delhi	SHRI CHIRAG GADI

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Haldia Petrochemicals Ltd, Kolkata	SHRI RAJ K. DATTA SHRI SUVOMOY GANGULY (<i>Alternate</i>)
HMEL, Noida	SHRI VINEET KUMAR GUPTA SHRI ALAKESH GHOSH (<i>Alternate</i>)
Huhtamaki Paper Product Ltd. (HPPL), Hyderabad	SHRI MUTHUSAMY CHOCKALINGAM SHRI AISHWARYA VANGE (<i>Alternate</i>)
IFCA	SHRI ATINDRA N. CHAUDHURI
IIT, Delhi	SHRI ANUP K GHOSH
Indian Centre for Plastics in the Environment (ICPE), Mumbai	SHRI T.K. BANDOPADHYAY SHRI ARUNAVA GUHA (<i>Alternate</i>)
Indian Institute of Packaging (IIP), Mumbai	DR SANJAY CHATTOPADHYAY DR TANWEER ALAM (<i>Alternate</i>)
Indian Oil Corporation, R&D Centre, Faridabad	SHRI DHANANJAY SAHOO
Indian Pharmacopoeia Commission, Ghaziabad	DR JAI PRAKASH DR MANOJ KUMAR PANDEY (<i>Alternate</i>)
Indian Plastic Institute (IPI), Mumbai	SHRI V. B. LALL SHRI MIHIR BANERJI (<i>Alternate</i>)
Ministry of Environment & Forests (MoEF), New Delhi	SHRI SATYENDRA KUMAR SHRI AMIT LOVE (<i>Alternate</i>)
National Committee on Plasticulture Applications in Horticulture (NCPAH), Ministry of Agriculture & Farmers Welfare, Govt. of India, New Delhi	SHRI ANAND ZAMBRE SHRI KRISHNA KUMAR KAUSHAL (<i>Alternate</i>)
ONGC Petro Additions Ltd (OPAL), Gujarat	SHRI VIVEK MEHTA
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Technical Training and Research Centre (TTRC), Lohia Group, Kanpur	SHRI R. K. DWIVEDI
The Toy Association of India (TAI), New Delhi	SHRI RAJESH ARORA SHRI R. K. VERMA (<i>Alternate</i>)
Voluntary Organization in Interest of Consumer Education (VOICE), New Delhi	SHRI M. A. U. KHAN SHRI H. WADHWA (<i>Alternate</i>)
BIS Directorate General	SHRIMATI NAGAMANI T, SCIENTIST 'E' AND HEAD (PCD) [REPRESENTING DIRECTOR GENERAL(<i>Ex-officio</i>)]

Member Secretary

SHRI SHIVAM DWIVEDI
SCIENTIST 'B' (PCD), BIS

Panel for Preparing Standard on Polyamide 6

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DSM	SHRI SANJAY SINGH SHRI SAINATH VAIDYA (<i>Alternate</i>)
Gujarat State Fertilizers & Chemicals Limited, Gujarat	SHRI P. D. KOTAK(<i>Convener</i>)
SABIC Innovative Plastics, Bengaluru	DR SUMANDA BANDYOPADHYAY

(Continued from second cover)

In this revision requirements for resin based filled and unfilled compounds have been incorporated.

The composition of the Committee responsible for formulation of this standard is given in Annex G.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Bureau of Indian Standards

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This Indian Standard has been developed from Doc No.: PCD 12 (18319).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Branches : AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. CHANDIGARH. CHENNAI. COIMBATORE. DEHRADUN. DELHI. FARIDABAD. GHAZIABAD. GUWAHATI. HIMACHAL PRADESH. HUBLI. HYDERABAD. JAIPUR. JAMMU & KASHMIR. JAMSHEDPUR. KOCHI. KOLKATA. LUCKNOW. MADURAI. MUMBAI. NAGPUR. NOIDA. PANIPAT. PATNA. PUNE. RAIPUR. RAJKOT. SURAT. VISAKHAPATNAM.